

SUPPORT FOR THE AMENDMENTS

In the amendment submitted above, Claim 9 has been canceled. Accordingly, no new matter is believed to have been added to the present application by the amendments submitted above.

REMARKS

Claims 8 and 10-14 remain pending. Favorable reconsideration is respectfully requested.

As set forth in Claim 8, the present invention relates to a process for the preparation of alkylarylsulfonates. An important aspect of the claimed process is the removal of 5 to 30% by weight, based on the C₁₀₋₁₂-olefins removed, of low-boiling constituents of the C₁₀₋₁₂-olefins, such that at least 90% of di- or poly-branched olefins are separated off.

The rejection of the claims under 35 U.S.C. §103(a) over Maas et al. in view of Scheibel et al. is respectfully traversed. The cited references fail to suggest the claimed process.

The Office recognizes that Maas et al. fail to disclose removal of 5 to 30% by weight, based on the C₁₀₋₁₂-olefins removed, of low-boiling constituents of the C₁₀₋₁₂-olefins, such that at least 90% of di- or poly-branched olefins are separated off as specified in Claim 8.

Scheibel et al. disclose cleaning products comprising improved alkylaryl sulfonate surfactants prepared via vinylidene olefins and processes for preparation thereof. According to page 1, second paragraph, highly branched alkylbenzene sulfonate surfactants are used in detergents, and these were found to be very poorly biodegradable. In addition, linear alkylbenzene sulfonates are not without limitations, for example, they would be more desirable if improved for hard water and/or cold water cleaning properties. Therefore, a person having ordinary skill in the art would learn from this disclosure that highly branched alkylbenzene sulfonate surfactants as well as linear alkylbenzene sulfonates are not perfect compounds being present in surfactant compositions.

According to the last paragraph on page 6 of Scheibel et al., “modifying an alkylaryl sulfonate surfactant by *reducing* linearity or “delinearization”, is effectively provided for in the process according to Scheibel et al. Further in this paragraph it is stated that the essence in the invention according to Scheibel et al, is the notion that linearity reduction is processed by use of vinylidene olefins, especially when combined with a particular type of alkylation”.

Therefore, a person having ordinary skill in the art learns from Scheibel et al. that branched alkylarylsulfonate surfactants are preferred, and that a process for *delinearization* is provided. This process according to Scheibel et al. comprises step (a) a dimerisation step, comprising reacting, in the presence of the dimerisation catalyst, an olefinic feed stock comprising α -olefins or mixtures thereof to form one or more vinylidene olefins having a carbon content of from 10 to 16 carbon atoms, see page 4, 4th paragraph. According to page 7, last paragraph, the opportunity to achieve a meaningful improvement by delinearization or branching in alkylbenzene sulfonate surfactants can be (i) selecting the feed stock wherein α -olefins consist essentially of a ternary mixture of α -olefins having 5 to 7 carbon atoms. According to page 8, second paragraph, the delinearized olefins according to Scheibel et al. are obtained by conducting the preparation steps without separation or extraction of said vinylidene olefins from oligomers,

The teaching of Scheibel et al. is that highly branched alkylarylsulfonate surfactants having improved characteristics can be obtained by a process comprising the dimerization of α -olefins, being olefins having the double bond in 1-position, in order to obtain dimerization products being olefins having vinylidene groups present in the alkyl chain. A proof for this can also be found on page 23 of the description of

the present application, where it is stated that α -olefins selectively react to vinylidenes, see lines 19 to 26 of page 23. This is in accordance with the teaching of Scheibel et al.

Further alkylation of aromatic compound with these vinylidene containing compounds according to Scheibel et al. gives rise to alkylaryl compounds having a high degree of branching, which, as discussed above, is advantageous according to Scheibel et al. The last step according to Scheibel et al. is sulfonation of these alkylaryl compounds.

In addition, in Scheibel et al. it is disclosed that a high amount of molecules are obtained that are arylated at terminal positions. According to page 23 of Scheibel et al., the Internal Isomer Selectivity (IIS) is 0 to 40, preferably 0 to 10, which means compounds being arylated at internal positions are present in an amount of 0 to 40%, preferably 0 to 10%, which further means that compounds being arylated at terminal positions are present in an amount of at least 60%, preferably at least 90%. The skilled artisan would therefore learn from Scheibel et al. that the use of α -olefins gives rise to dimerization products having vinylidene groups which further give rise to aryl alkanes that are arylated predominantly at terminal positions.

The contrast between the teaching of Scheibel et al. and the process according to Claim 8 of the present application is that step b) according to the present application comprises the dimerisation of 2-pentene and/or 3-hexene obtained in stage a), 2-pentene and 3-hexene are not α -olefins, as taught by Scheibel et al. Therefore, dimerization of these olefins having the double bond in an internal position, does not give rise to dimerization products being olefins having at least one vinylidene group in the molecule. This contrast between Scheibel et al. and the process according to

Claim 8 of the present application causes that the amount of terminally arylated compounds does not succeed 50%. According to page 1, line 28 to page 2, line 3 of the description, the amount of 2-phenyl alkanes is about 30%, and the amount of 2- and 3-phenyl alkanes is about 50%. In addition, if the amount of terminal aryl alkanes is excessively high which means higher than 50%, the processability of these products suffers as a results of a large increase in the viscosity of the sulfonates.

Further, in contrast to Scheibel et al., an even higher amount of linear alkylaryl compounds, C_{10-12} -olefin being low boiling constituents are removed after the dimerisation step, in order that at least 90% of the di- or polybranched olefins are separated off. This additional step causes that compounds are obtained that show an improved biodegradability, because di- and polybranched olefins are removed which would cause a low biodegradability.

The process according to the present application therefore give rise to compounds which differ from the ones according to Scheibel et al. in at least two ways.

First, the amount of terminally arylated compounds is restricted to about 50% caused by the use of 2-pentene and/or 3-hexene as starting olefins, whereas Scheibel et al. use α -olefins which end up in aryl compounds having an amount of terminal isomers of at lat 60%, preferably at least 90%. As a consequence thereof the compounds according to the present invention show an improved processability.

Second, at least 90% of di- or polybranched compounds are separated of in the process according to the present invention, causing an improved biodegradability of these compounds.

Further, according to page 24, lines 20 and following of the description, the specific mixture of olefins obtained in step b) is arylated in step c). According to

lines 23 and 26, this olefin mixture has an optimum structure/linearity in respect of the degree and the type of branching, in order to obtain advantageous alkyl aromatic compounds in stage c).

The characteristic process according to Claim 8 of the present application therefore gives rise to compounds having an advantageous combination of features as explained above, being improved processability and improved biodegradability.

A person having ordinary skill in the art and looking for a process to such improved linear alkylaryl compounds which can further be sulfonated, would obtain the teaching by Scheibel et al., that α -olefins shall be dimerized in order to obtain olefins having vinylidene groups. In addition, the skilled artisan would conclude that these vinylidene-containing olefins give rise to advantageous highly branched alkylaryl compounds, which, in turn, give rise to advantageous alkylaryl sulfonate surfactants. Thus, a person having ordinary skill in the art would not conclude from Scheibel et al. that olefins having internal double bonds like 2-pentene and/or 3-hexene should be used in order to get predominantly linear compounds. A person having ordinary skill in the art also would not conclude that terminal aryl alkanes shall be present in an amount of about 50% but not more, because Scheibel et al. teach an amount of at least 50%, preferably at least 90%.

In addition, a person having ordinary skill in the art would further not conclude from the teaching from Scheibel et al., to remove di- or polybranched C_{10-12} -olefins from the mixture obtained in the dimerization step, because Scheibel et al. teach that these compounds are the preferred olefins. Therefore, Scheibel et al. cannot point in the direction that these compounds shall be removed, in order to improve biodegradability.

Therefore, a person having ordinary skill in the art would not get the motivation or teaching in Scheibel et al, to remove di- or polybranched compounds, because according to Scheibel et al., these compounds are the preferred ones and should not be separated off.

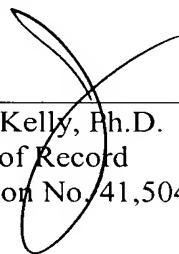
In view of the foregoing, the combination of Maas et al. and Scheibel et al. fails to suggest the claimed process. Accordingly, Claims 8 and 9-14 are not obvious over those references. Withdrawal of this ground of rejection is respectfully requested.

Applicants submit that the present application is in condition for allowance. Early notice to this effect is earnestly solicited.

Respectfully submitted,

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